

PAMELA

Pamela, the fourth typhoon of 1976, was also the first super typhoon of the season. Destined to become one of the more destructive storms of history, Pamela was first detected on the morning of 13 May as a tropical disturbance near the eastern edge of the near equatorial trough approximately 230 nm north of Truk. For the next 24 hours the disturbance was difficult to track with the sparse synoptic data available, however, satellite pictures indicated a general southward movement. On the morning of the 14th the disturbance began to move to the southwest and at 0600Z it was upgraded to TD 06. By that evening the depression was moving west at 5 to 7 kt. At 0339Z on the 14th aircraft indicated surface winds near 40 kt and a sea level pressure of 998 mb; at 0600Z TD 06 was upgraded to Tropical Storm Pamela. Shortly thereafter Pamela began to move to the south at 9 to 10 kt, intensifying to 45 kt by 1800Z.

The next morning satellite data showed that Pamela was moving toward the south-southeast. Truk synoptic data at 1800Z indicated a sea level pressure of 998.6 mb, a 7.1 mb fall over the previous 24 hours. By 2200Z Truk had a surface pressure of 997.9 mb and northeasterly winds of 30 kt. At this time Pamela was forecast to trace a counter-clockwise loop around Truk. At 0348Z on the 16th an aircraft fixed Pamela 75 nm southeast of Truk and proceeded on a northeast track gathering peripheral information. Later that afternoon reports indicated destructive winds at Satawan Atoll (91338). The aircraft was diverted to the region of the atoll where the crew observed an extensive area of 55 to 65 kt flight level winds with surface winds estimated as high as 100 kt. At 0740Z on the 16th warning number 09 was amended to upgrade the storm to Typhoon Pamela. Pamela at this time was a small but intense typhoon (Fig. 4-7). The maximum winds were located on the south side of the 150 nm diameter central dense overcast.

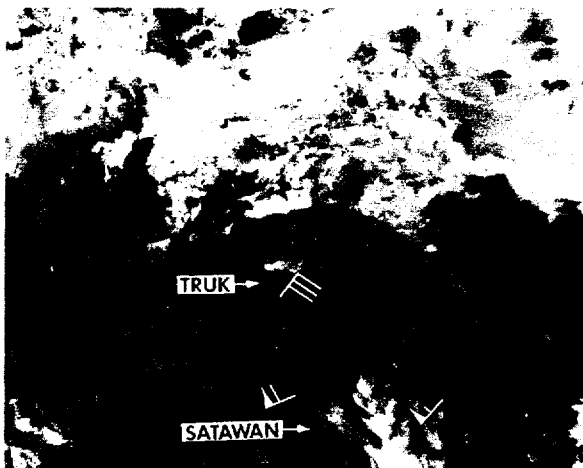


FIGURE 4-7. Infrared photograph of Pamela near 65 kt 75 nm southeast of Truk, 16 May 1976, 0938Z. Wind barbs represent 700 mb winds observed by reconnaissance aircraft from 0600Z to 1000Z. (DMSP imagery)

During the next 36 hours Pamela continued to intensify as it moved erratically at 3 to 6 kt, turning northwestward on the morning of the 17th. From the morning of the 16th until the morning of the 18th, Satawan Atoll continued to be buffeted with southwesterly and southerly surface winds of 50 to 55 kt. Damage was widespread on the tiny atoll, but no deaths were reported.

By the morning of the 18th Pamela had accelerated to 7 kt, passing within 50 nm of Truk. A minimum sea level pressure of 993.4 mb was recorded at 0400Z and a peak wind of 49 kt was observed an hour later. At 0327Z aircraft found maximum surface winds of 85 kt, a minimum pressure of 951 mb and a circular eye 10 nm in diameter. From the afternoon of the 17th to the afternoon of the 18th Truk recorded nearly 11 inches of rain which initiated mud slides killing 10 persons. Massive damage was inflicted on crops.

Pamela's erratic movements can be attributed to the influence of the Tropical Upper Tropospheric Trough (TUTT). On the 13th the TUTT began to establish itself north of the disturbance. Through the evening of the 15th the TUTT moved steadily south-southwestward, applying pressure to the upper anticyclone above Pamela. This pressure accounted for Pamela's southward and westward movement, and for the cyclone's slow intensification. By the morning of the 16th the TUTT had receded northward relieving the southward pressure, enhancing outflow and allowing the tropical storm to intensify. This release of pressure would have allowed the storm to move toward a climatological west-northwest track, however, by the 15th, an induced mid-tropospheric high pressure cell between Pamela and Typhoon Olga (in the Philippine Sea) had intensified, building eastward and forcing Pamela toward the east. By early morning on the 17th Olga had moved considerably to the west, the ridge had relaxed, and Pamela swung north and then northwest completing the loop around Truk.

From 0600Z on the 18th to 0600Z on the 19th Typhoon Pamela moved toward the northwest at an average speed of 9 kt, intensifying at a rate of 10 kt each 6 hours. At 1200Z on the 19th Pamela reached its super typhoon intensity of 130 kt with gusts to 160 kt (see photograph on front cover), which it maintained for 18 hours. At 2112Z on the 19th reconnaissance aircraft reported the minimum measured sea level pressure at 921 mb while observing concentric eye wall clouds with diameters of 10 and 20 nm. By the afternoon of the 20th, an eastward moving short-wave trough had created a weakness in the mid-tropospheric subtropical ridge north of Pamela. This, coupled with an elongated high pressure cell east of the typhoon, forced Pamela to acquire the north-northwestward track which would bring it over Guam.

A possible threat to the island had been identified as early as the 16th, and all forecasts subsequently issued indicated that Pamela was expected to pass within 100 nm of Guam. At 0450Z on the 18th the Commander, Naval Forces Marianas (COMNAVMAR) set Typhoon

Condition III for Guam. At 2330Z on the 18th COMNAVMAF set Typhoon Condition II and at 2330Z on the 19th Condition I was set.

During the next 24 hours northeasterly winds on Guam slowly intensified as Pamela approached the island. At 1800Z on the 20th the National Weather Service (NWS) at Taguac (91217) reported 73 kt winds at the 3000 ft level while surface winds were only 30 kt (Fig. 4-8). At 0315Z on the 21st reconnaissance aircraft from the 54th Weather Reconnaissance Squadron, Andersen AFB, Guam fixed the typhoon 30 nm southeast of the island. Less than 90 minutes later the northwestern edge of the eye was over the southeast coast of Guam.

The large, relatively calm eye, some 20 nm in diameter, required up to three hours to cross the center of the island (Fig. 4-9). Both Andersen AFB and the NWS at Taguac continually experienced winds exceeding 50 kt as the eye passed south of these stations. Most installations which had wind indicators lost their anemometers prior to the peak

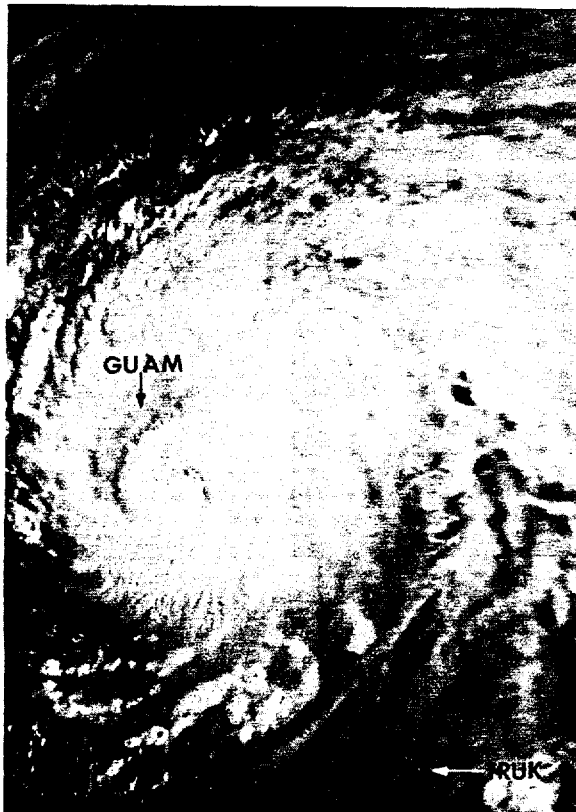


FIGURE 4-8. Typhoon Pamela at 120 kt intensity 65 nm southeast of Guam, 20 May 1976, 2134Z. (DMSP imagery)

winds. The maximum observed wind gust was 138 kt reported by the NWS Taguac at 0946Z. The minimum recorded surface pressure was 931.7 mb at NAS Brewer Field, some 5 nm northeast of the center. The lowest pres-

sure of approximately 930 mb (indicated by aircraft and land stations) supports estimated peak sustained winds of 120 kt with gusts of 145 kt. Pamela's winds gusted as much as 80 kt between peak and lull in a matter of minutes, resulting in extremely large pressure differences (60-70 lbs per square foot) on windward and leeward sides. Few unreinforced structures were able to withstand the intermittent pressure and wrenching effects. NWS Taguac recorded 33 inches of rain during Pamela's passage, with 27 inches falling in a 24-hour period.

SUPER TYPHOON PAMELA

GUAM, 21 MAY 1976

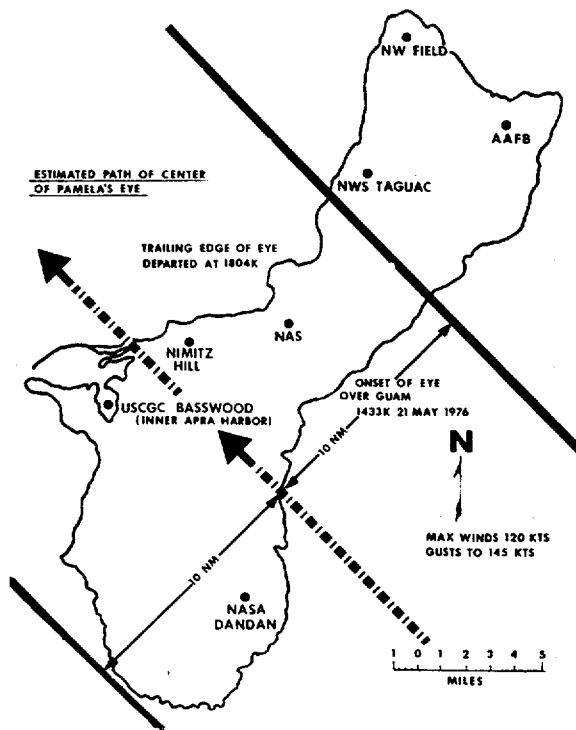


FIGURE 4-9. Estimated path of the center of Pamela's eye as it crossed Guam from 0433Z to 0804Z, 21 May 1976.

Although the winds of Pamela were 25 kt weaker than those of Typhoon Karen which flattened the island in November 1962, the slow 7 kt movement rendered Pamela more destructive (Fig. 4-10 and back cover). The 226 square mile island was buffeted by winds in excess of 100 kt for 6 hours, by winds of typhoon force for 18 hours and by winds exceeding 50 kt for 30 hours. The last warning on Pamela by JTWC was issued at 2320Z on the 20th. The alternate JTWC at Yokota AB, Japan assumed all warning responsibilities for Pamela and Olga during the next 5 days.

All Naval and Air Force units had been given adequate warning and had evacuated most

of their ships and aircraft. Despite extensive preparations damage to civilian and military facilities was severe, exceeding \$500 million (Fig. 4-11, Fig. 4-12 and Fig. 4-13). Ten small ships and tugs which had sought refuge in Apra Harbor, were either sunk or ran aground, and numerous other small craft were sunk or damaged (Fig. 4-14). One ship, the U. S. Coast Guard Cutter Basswood, courageously rode out the storm anchored in Apra Harbor where it recorded a peak gust of 120 kt and a minimum sea level pressure of 933.1 mb.

Miraculously, only one death occurred on Guam due to Pamela's passage. This low loss of life was attributed to the timely and accurate forecasts issued on the storm. A comprehensive account of lessons learned from Pamela is given in the Super Typhoon Pamela After-Action Report, prepared by CINCPAC REP GUAM/TTPI in August 1976.

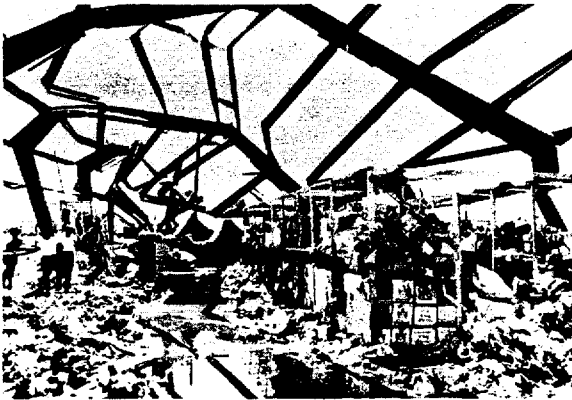


FIGURE 4-10. The twisted steel skeleton of a once substantial warehouse attests to the destructive force of Pamela. (Official U. S. Navy photograph)



FIGURE 4-12. The long line at Andersen AFB, Guam was representative of those throughout the island as the refugees of Pamela gathered for food, water and other supplies. (Official U. S. Navy photograph)



FIGURE 4-11. Destruction was widespread in Guam's civilian community. Concrete structures fared well, but wooden houses, power lines and the telephone system were all severely damaged. (Official U. S. Navy photograph)



FIGURE 4-13. Super Typhoon Pamela inflicted heavy damage to military facilities on Guam. This is Andersen AFB housing. (Official U. S. Navy photograph)



FIGURE 4-14. Two grounded tugs at U. S. Naval Station, Guam. Powerful wind and wave action produced by Typhoon Pamela affected even the inner Apra Harbor. (Official U. S. Navy photograph)

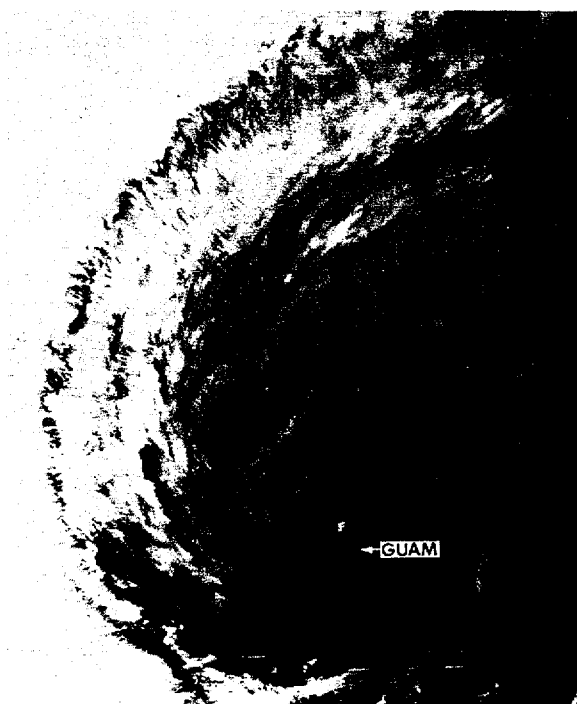


FIGURE 4-15. Infrared photograph of Typhoon Pamela at 120 kt 30 nm northwest of Guam, 21 May 1976, 1018Z. (DMSP Imagery)

After devastating Guam, Pamela continued to maintain its 120 kt intensity for an additional 36 hours, moving northwestward at an average speed of 10 kt (Fig. 4-15). Saipan (91232) experienced gusts of 55 kt and received 10 inches of rain as the storm passed 120 nm west of the island. As Pamela continued to threaten the northern Mariana Islands, mop-up operations were in full swing on Guam (Fig. 4-16 and Fig. 4-17). Although the civilian and military factions were well-organized and worked closely together, recovery efforts took months.

On the morning of the 23rd Pamela, still packing winds of 115 kt, slowed to 8 kt, and by that evening had passed through a weakness in the mid-tropospheric subtropical ridge, recurving to the northeast. At 2000Z on the 24th, Pamela passed 15 nm to the east of Iwo Jima (47981) blanketing the island with 75 kt winds (Fig. 4-18). By 1800Z on the 25th the system had weakened into a tropical storm. The cooler sea surface temperatures and tremendous vertical shear rapidly stripped the storm of its tropical characteristics, and by the afternoon of the 26th Pamela had become extratropical.

Pamela's 15 day trek took it a distance of 2570 nm during which a total of 52 warnings were issued, 40 of them as a typhoon.

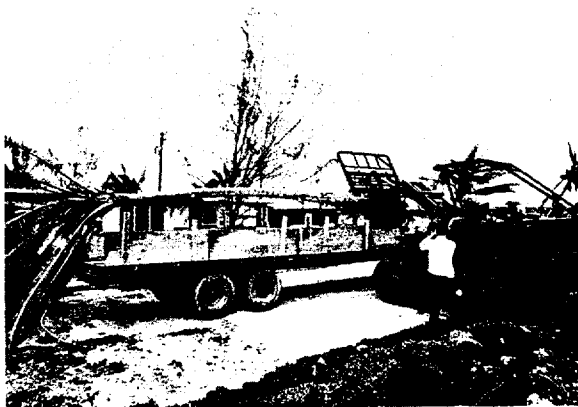


FIGURE 4-16. An Air Force crew removes one of numerous trees uprooted during Pamela's rampage. This was typical of island-wide clean-up operations performed by military and civilian personnel. (Official U. S. Navy photograph)

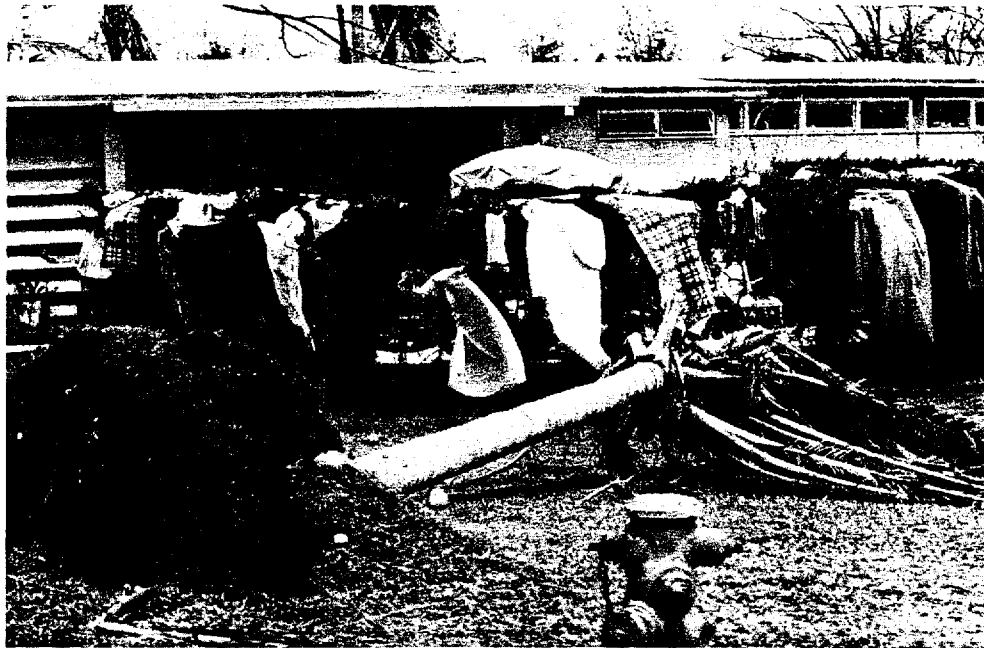


FIGURE 4-17. Few, if any, establishments on Guam escaped water damage from Pamela's driving rains. Massive destruction to power transmission facilities rendered drying-out a slow process. (Official U. S. Navy photograph)

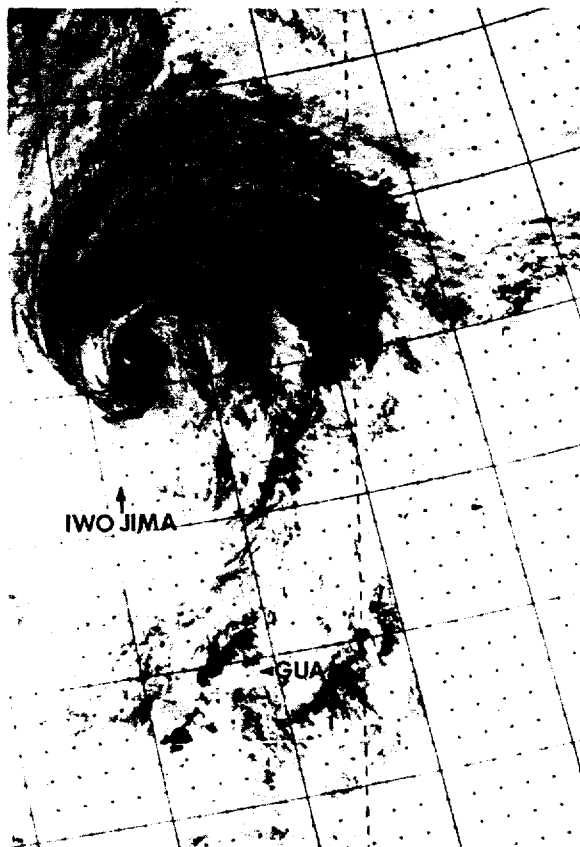


FIGURE 4-18. Infrared image of Typhoon Pamela at 65 kt 95 nm northeast of Iwo Jima, 25 May 1976, 0931Z. (DMSP imagery)